

# Memogram AB

## LTE Radio Performance and Indoor Planning, 3 days

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### Course description



Long Term Evolution, LTE, is being rolled out as the new 4G system. Multiple 4G networks already run commercial services, as they have been operational for a couple of years.

The initial design and tuning of these 4G networks was towards macro cell based coverage and single band, single service implementations. As 4G becomes more dominant in terms of traffic volume and spectrum utilization, capacity upgrade based on indoor solutions will be crucial to handle the demand and economics. Optimizing the mobile network for higher indoor performance will require good understanding of the features and parameters that are influencing the end to end user experience.

This course covers those important features and KPIs that define perceived quality and performance; typically throughput capacity, coverage, intra-LTE interference and co-existence with legacy 2G and 3G systems. A number of implementation scenarios are presented with the focus on indoor coverage and planning.

The 4G/LTE radio characteristics and its performance is described thoroughly, together with the new features that support radio self-optimization, self-tuning and self-healing.

HETNET is addressed and related to the new LTE advanced features. The impact of eICIC, Femtocells, Relay nodes, multiband and multi-standard support is analyzed and future scenarios are discussed. Different Operator strategies on spectrum re-farming, extended LTE capacity and new feature implementations like carrier aggregation and dual band are presented and discussed.

Furthermore, the indoor coverage and planning aspects are covered in detail. Indoor MIMO multilayer support is elaborated together with Repeater and Distributed Antenna System planning for indoor installations. Different indoor cases like tunnel, elevator and high building office solutions are studied in terms of exercises. Requirements for Femto-Macro cell mobility, in terms of Data Session and Voice Call Continuity, are also addressed.

### Course Content

#### Basic and new LTE features

- The major differences between LTE and UMTS
- eNodeB basic features and the OFDMA principles for capacity management
- Intra-LTE mobility principles for idle and connected mode
- Principles behind radio bearers and their mapping to QoS Classes in LTE and UMTS
- End-to-end Session/Call-set up principles related to EPS and radio bearer setup

- Automatic Neighbor Relation function and other SON features
- Available multi-band LTE scenarios and CA, carrier aggregation support

#### OFDMA radio characteristics

- Important differences between WCDMA and OFDMA
- RF channel bandwidth and multiband support
- Peak throughput calculations
- Radio resource scheduling and link adaptations

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- Modulation schemes, symbol rates and cyclic prefix lengths
- Advanced antenna features and configurations for diversity and MIMO multilayer
- Neighbor list optimization with ANR
- Availability of X2 support for inter-cell interference coordination
- Relay and Repeater options in LTE Radio
- Optimization guide summary: important parameters to consider

## Coverage requirements and challenges

- Cell edge throughput and peak rate req.
- Interference cancellation and coordination
- Average cell throughput calculations in loaded network
- Hierarchical cell structures with multiband coverage
- Macro cell based indoor coverage requirements
- Femtocell and macrocell integration with ICIC
- Important KPI optimization targets in commercial LTE services

## Indoor RF planning basics

- The RF planning process
- Isolation challenges and Zone planning
- Combining indoor and outdoor coverage

- Passive vs active iDAS
- RF measurements and evaluation
- Indoor solutions with multioperator support

## RF calculations

- Indoor propagation and channel models for LTE
- Gain and loss calculations in uplink and downlink
- Sensitivity calculations with and without TMA
- Repeater gain and capacity calculations
- Indoor link budget calculations for coverage and capacity

## Plan and design typical LTE indoor solution

- Passive, active and hybrid iDAS
- Planning the iDAS solution
- Planning the Femto solution
- Introducing the indoor repeater solution
- Planning and designing indoor MIMO
- Configuring the UL/DL power to meet target performance
- Calculating MIMO antenna options and distance separations
- Combining iDAS and MIMO for indoor
- Upgrading existing iDAS
- Introduction of multioperator support

## Who should attend

The target audience for this course is Radio, Field and Service Engineers, product and project managers and similar experienced professionals within the ICT community.

Instructor on this course is: [Thomas Giarimi](#), experienced Senior Consultant



## Prerequisites

Candidate participants must have working knowledge from network operations, planning or design of UMTS and LTE systems.

## Duration

The length of the course is 3 days and the maximum number of participants is 12. The course is based on theoretical instructor-led lectures and exercises.

## Ordering information

Request a quote by emailing course ID '3322' to: [admin@memogram.com](mailto:admin@memogram.com)